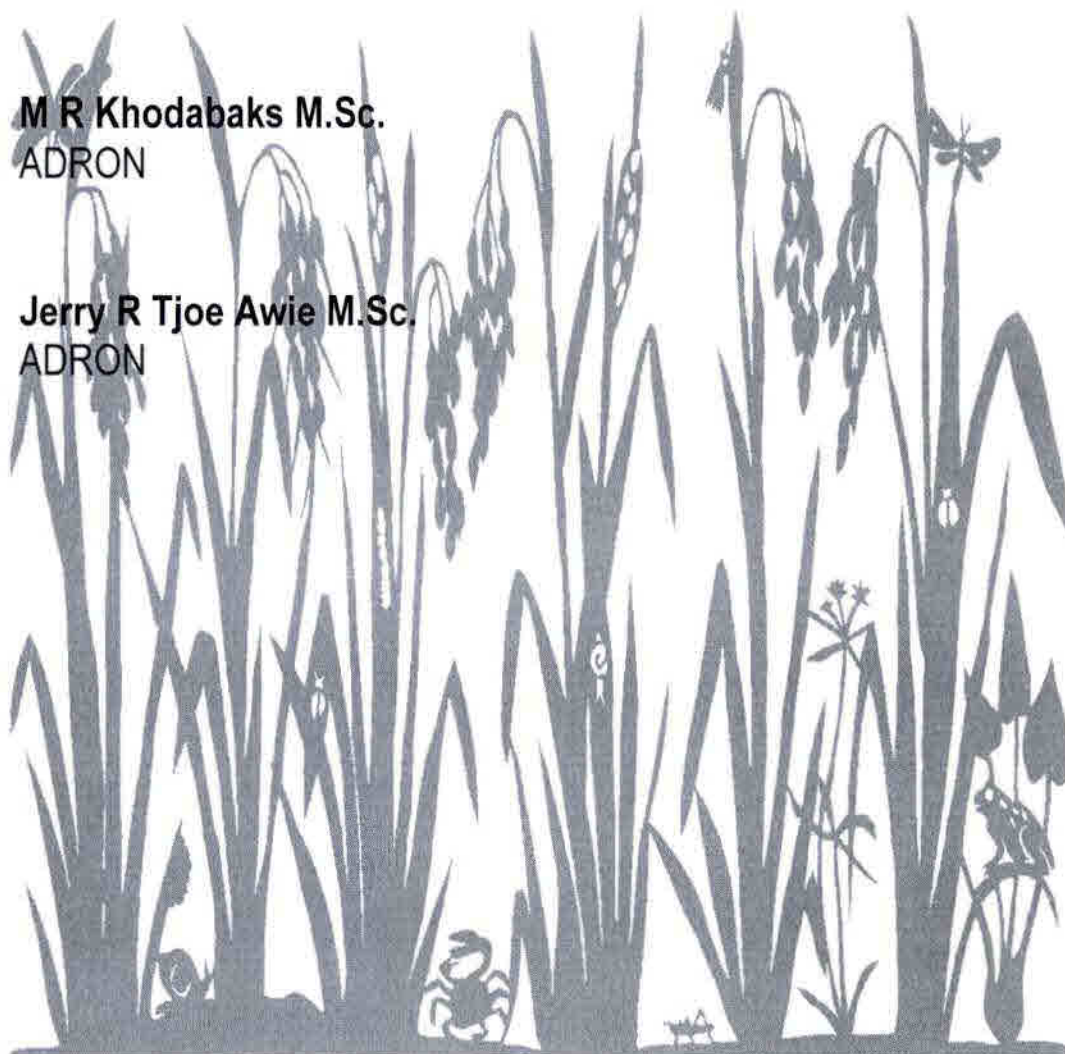


## **Caragoal 400SC gives good control against apple snail (*Pomacea spp.*)**

Report on trials conducted in Suriname, 2002- 2003

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# Caragoal 400SC gives good control against apple snail (*Pomacea spp.*)<sup>1</sup>

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**Abstract:** Currently fentin acetate is the most widely used pesticide to control apple snail (*Pomacea spp.*) in rice fields in Suriname. Caragoal 400SC is a less dangerous chemical to control this pest. In cooperation with Luxan B.V., a trial was conducted to assess the degree of control that Caragoal 400SC gives under the conditions prevalent in the rice production area of the district of Nickerie in Suriname. Two trials were conducted in the period June 2002 - April 2003. Caragoal 400SC gave good control if applied at a rate of 1.0 l/ha when using the dry sowing method (sowing in flooded fields but draining after 2 days and re-flooding after 12 days) and at a rate of 1.25 l/ha when using the wet sowing method (sowing in flooded fields and draining after 20 days). Fentin acetate had phytotoxic effects on the seedlings when applied at sowing, while Caragoal 400SC did not. Caragoal also prohibited the grazing capabilities of the snails that were not dead. Damage to the seedlings was minimal.

## 1. Introduction

Snail species of the genus *Pomacea* were not considered a rice pest in Suriname until around 1940 when the then entomologist of the Agricultural Experimental Station, Dr. D.C. Geijskes, observed snail damage by *Pomacea lineata* in rice nurseries. This was long before these snails were regularly found in rice fields near the Experimental Station. In the mid 1950's *Pomacea spp.* were considered a most serious menace to the rice crop, especially in the large polders of the Nickerie district, in the northwestern part of the country. This situation was, in part, brought about by the then newly extended direct sowing method in the field instead of transplanting from nursery beds (Van Dinther, 1956).

In the early days snails were controlled by hexachlorocyclohexane (HCH). Snails are now mainly controlled by fentin acetate. Fentin acetate has a well-documented detrimental effect on the environment as well as on human and animal health.

Caragoal 400SC with active ingredient metaldehyde is an effective molluscicide in the rice fields. Metaldehyde is largely non-toxic to fish, but effective against apple snail. Mills et al. (1989) found metaldehyde to be toxic on the snail's nervous system and to possess anaesthetic properties.

Trials by Luxan in 1998 and 1999 in Suriname gave good results (Coupland, 2002). In these trials the emphasis was on the mortality rate of the snail. Our interest was in knowing at what dose rate the product causes the snails to be merely inactive (no feeding activity on young rice plants) during the window of time that the young rice plants are susceptible for grazing by the snails. Under laboratory conditions this window of time extended up to 20 days after sowing.

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The objectives of this trial were to:

- establish an effective crop protection and dose rate with Caragoal.
- have a crop protection approach (in other words, not a mortality approach).
- establish at which (lower) dosage an equal efficacy in terms of undamaged rice plants could be achieved.

## 2. Materials and methods

Trials were conducted June to October 2002 (trial 1) and December 2002 to April 2003 (trial 2) at Anne van Dijk Rice Research Centre Nickerie (ADRON), Nickerie, Suriname.

### *Experimental setup*

Two sowing methods were used:

- method 1: sowing carried out in flooded fields without drainage for 20 days (common practice)
- method 2: sowing carried out in flooded fields that were drained after 2 days and re-flooded after about 12 days.

One 80 x 40 m field was divided into two fields of 40 x 40 m; one was assigned for sowing method 1 while the other was for sowing method 2. Treatments were completely randomised. Cages of 2 by 2 m were placed as experimental units (plots), in total 24 per field. The cages were placed within at least 2 m distance from each other and were embedded in the mud to prevent snails from escaping. A net was placed over the cage to protect the snails against the snail kite (local name: pakro aka).

### *Treatments*

In each field, the following treatments were used: 4 treatments of Caragoal 400SC (0.75, 1.0, 1.25 and 1.5 l/ha), 1 treatment of fentin acetate (0.5 kg/ha), plus a control plot. There were four replications. 15 Snails were placed in each cage. The snails had been collected near ADRON's experimental fields.

The field preparation was according to common practice: dry tillage followed by wet tillage.

After the field preparation, the cages were placed in the field along with the snails. The plots were sown with the variety ADRON-111. A seed rate of 150 kg/ha was used.

In the first trial fentin acetate was applied at sowing at the same time as Caragoal. While, in the second trial fentin acetate was applied 3 days before sowing (common farmer practice). In Table 1, the application of the pesticides and the sowing of the plots for the two trials are illustrated as a function of time.

The following observations were recorded: mortality rate over a period of 26 days, rice plants per cage at emergence, damage of rice plants, water depth, water temperature and yield at harvest.

**Table 1:** Timetable for applying the pesticides and sowing the plots for the two trials

activity	first trial	second trial
snails in cages	day -3	day -3
Fentin acetate applied	day 0	day -3
Caragoal applied	day 0	day 0
plots sown	day 0	day 0

### 3. Results and discussion

#### ***Mortality***

##### Trial 1

In the first trial there was quite high mortality (Table 2). For sowing method 1 results with Caragoal differed significantly from that with fentin acetate. At 50 %, the mortality was quite low with fentin acetate. There were no differences amongst the three highest Caragoal treatments. There was only a slight difference in mortality rate between the lowest concentration (0.75 l/ha) and the highest concentration (1.5 l/ha) of Caragoal. For sowing method 2 applications of 1.25 l/ha Caragoal and higher gave 100 % mortality. Also for the treatment with fentin acetate, a mortality of 100 % was achieved.

##### Trial 2

In the second trial (Table 3), which was conducted a season later than the first trial, there was a lower mortality of snails, except for the fentin acetate treatment. For both sowing methods, fentin acetate had the highest mortality. The trends in mortality between the different concentrations and sowing methods were the same as in the first trial. For sowing method 2, the mortality with the different concentrations of Caragoal was between 40 % and 60 %. In the plots with sowing method 1, the mortality was lower.

Though the trend in mortality was the same, there was a significant difference in mortality between the first and second trial. The lower temperature could have caused the lower mortality of the second trial. During the first trial, the average temperature of the water in the fields during daytime was 32 °C while during the second trial it was 26 °C.

#### ***Number of plants***

In both seasons the number of plants were significantly different ( $P < 0.001$ ) for the two sowing methods and for the various treatments. The number of plants, which had survived the snail attacks increased with increasing doses of Caragoal. In the first trial (Table 2), the fentin acetate-treated plots had significantly less plants than the Caragoal treatments. This is attributed to the toxic effect that fentin acetate has on young seedlings. Applying the fentin acetate 3 days before sowing (second trial, Table 3) left a higher number of plants alive.

While the mortality of snails in the second trial was not as high as in the first trial, the number of plants in the second trial did not differ much from that in the first trial for the two highest concentrations of sowing method 1 and all Caragoal treatments of sowing method 2. This indicated that the Caragoal treatment affected the feeding activity of the snails, causing it to decrease at higher concentrations.



## Yield

### Trial 1 (Table 2)

For sowing method 1, the yields for Caragoal treatments of 1.25 l/ha and 1.5 l/ha were not significantly different. For sowing method 2 all treatments yielded significantly higher ( $P < 0.01$ ) than for sowing method 1. For sowing method 2, the yields of the plots with the three highest concentrations of Caragoal (1.0 – 1.25 – 1.5 l/ha) were not significantly different from each other ( $P < 0.05$ , LSD test).

### Trial 2 (Table 3)

In the second trial trends were similar to the first trial, especially for the Caragoal treatments. The yield of the fentin acetate treatment was different from that of the first trial presumably because the fentin acetate was applied 3 days before sowing (as common practice dictates), so it did not have such phyto-toxic effects as in the first trial.

For sowing method 1 a high yield was already achieved at a concentration of 1.25 l/ha of Caragoal (this yield did not differ significantly from the yields at a higher dose). For sowing method 2, this yield was recorded at 1.0 l/ha. The yield from the fentin acetate plots did not differ significantly from the three highest Caragoal treatments of sowing method 1 and not for the two highest Caragoal treatments of sowing method 2.

The yield data from the first trial and the second trial cannot be pooled, on account of very large seasonal effects. During the second trial the weather was very favourable: enough water and a high level of solar radiation. The overall yields in the second trial were therefore much higher than in first trial, with the highest yield reaching 9 ton/ha

In Tables 2 and 3, comparison of mortality, number of plants and yield for the different treatments using LSD test are illustrated for the first and second trial respectively.

**Table 2:** Comparison of mortality, number of plants and yield for the different treatments using LSD test- first trial (June – October 2002)

sowing method 1				
treatment	mortality (%) at 26 das		number of plants at 26 das	mean yield (t/ha)
Caragoal 1.5 l/ha	85.0	a	127.3	a
Caragoal 1.25 l/ha	83.3	a	116.1	ab
Caragoal 1.0 l/ha	76.7	ab	77.5	b
Caragoal 0.75 l/ha	71.7	b	54.1	c
Fentin acetate	53.3	b	6.1	d
Control	28.3	c	0.0	d
sowing method 2				
Caragoal 1.5 l/ha	100.0	a	160.5	a
Caragoal 1.25 l/ha	100.0	a	147.8	a
Caragoal 1.0 l/ha	96.7	a	112.3	ab
Caragoal 0.75 l/ha	91.7	a	62.6	b
Fentin acetate	100.0	a	82.6	bc
Control	35.0	b	11.3	c

Means followed by the same letter within a column are not significantly different from each other at  $P < 0.05$  (LSD-test)

**Table 3:** Comparison of mortality, number of plants and yield for the different treatments using LSD test- second trial (December – April 2003)

sowing method 1					
treatment	mortality (%) at 26 das		number of plants at 26 das		mean yield (t/ha)
Caragoal 1.5 l/ha	16.7	b	161.6	a	8.38 a
Caragoal 1.25 l/ha	16.7	b	113.2	ab	8.17 a
Caragoal 1.0 l/ha	20.0	b	21.8	c	2.08 b
Caragoal 0.75 l/ha	13.3	b	0.0	c	0.00 b
Fentin acetate	78.3	a	144.1	ab	8.78 a
Control	1.7	c	0.0	c	0.00 b
sowing method 2					
Caragoal 1.5 l/ha	61.7	b	153.8	a	8.86 a
Caragoal 1.25 l/ha	45.0	bc	126.4	ab	9.06 a
Caragoal 1.0 l/ha	43.3	c	102.3	bc	9.08 a
Caragoal 0.75 l/ha	43.3	c	77.3	cd	7.34 b
Fentin acetate	96.7	a	146.3	a	9.09 a
Control	16.7	d	65.1	d	6.53 c

Means followed by the same letter within a column are not significantly different from each other at  $P < 0.05$  (LSD-test)

#### 4. Conclusions

In both trials, the method of water management after sowing greatly affected the control of the snails with Caragoal 400 SC. For sowing method 1 (draining the field after 21 days) a higher concentration of Caragoal than for method 2 (draining the field after 2 days and re-flooding after 12 days) had to be used to achieve adequate control. The yield registered with abovementioned treatments of Caragoal did not differ significantly from the yield recorded with the fentin acetate treatment.

Fentin Acetate had a toxic effect on the rice plants; it had to be used at least 3 days before sowing. Caragoal did not demonstrate such effect; it can also be applied after sowing.

Caragoal had a negative effect on the grazing capabilities of the snails. Even at higher concentrations in the second trial, there were quite a few snails still alive. However, they seemed to be incapacitated by the Caragoal.

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